Kelly Zhu

Computer Vision, Autonomous Driving & Perception

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EDUCATION

University of Toronto, St. George — **Toronto, ON**
Bachelor of Applied Science (BASc) in Engineering Science — *Sep 2019–Apr 2024 (expected)*

- Major: Machine Intelligence, Minor: Robotics & Mechatronics
- Dean's Honours List

PUBLICATIONS

- Y. Liu, **K. Zhu**, G. Wu, Y. Ren, B. Liu, Y. Liu, J. Shan — *2023*
  MV-DeepSDF: Implicit Modeling with Multi-Sweep Point Clouds for 3D Vehicle Reconstruction in Autonomous Vehicles
  In International Conference on Computer Vision (ICCV), Paris, France, October 2023

PATENTS

- Yuan Ren, Yibo Liu, **Kelly Zhu**, Bingbing Liu. Methods and Processors for Implicit Modeling with Multi-Sweep Point Clouds for 3D Vehicle Reconstruction in Autonomous Driving. — *2023*
  PCT Application Number: PCT/CN2023/101585 *(Patent Pending)*

AWARDS & DISTINCTIONS

- DAAD RISE Germany 2023 Scholarship Recipient *(Value of $6000)* — *2023*
- Mitacs Research Training Award *(Value of $6000)* — *2020*
- ESROP – Engineering Science Research Opportunity Program *(Value of $6000)*
- University of Toronto Scholar *(Value of $7500)* — *2019*
- Faculty of Applied Science & Engineering – Dean's Merit Award *(Value of $2500)*

RESEARCH EXPERIENCE

Robot Vision and Learning (RVL) Lab — **University of Toronto**
Undergraduate Thesis Student (Supervised by Prof. Florian Shkurti) — *Sep 2023–Present*

- Developing a BEV detection and trajectory prediction framework using LiDAR data to achieve real-time and collision-free predictions in multi-agent scenarios
- Working towards the development of an end-to-end motion planner for the task of sidewalk navigation
- Conducting an extensive analysis and review of existing end-to-end perception, prediction, and motion planning baselines in the literature

safe.trAIn by Siemens AG | DAAD RISE Germany — **Hochschule Düsseldorf**
Undergraduate Researcher (Supervised by Prof. Alexander Braun) — *Jun 2023–Aug 2023*

- Government-funded project in Germany for investigating the use of AI-based methods to develop safe and reliable autonomous train systems
- Led a solo computer vision project on 3D landmark detection using multimodal fusion of LiDAR and camera data to aid with downstream task of sensor calibration
- Presented research results to project consortium, resulting in approval of proposed methods and implementation into safe.trAIn's project pipeline

Huawei Noah's Ark Lab | Autonomous Driving Division — **Toronto, ON**
Perception Researcher — *May 2022–Apr 2023*

- Researched LiDAR-based 3D scene reconstruction methods to aid with the development of simulation platforms for autonomous driving

- Developed a novel 3D vehicle reconstruction method by employing multi-frame aggregation of LiDAR sweeps, achieving SOTA performance on existing 3D reconstruction benchmarks (ICCV 2023)
- Other topics of research included LiDAR sensor simulation and multimodal scene understanding

Space and Terrestrial Autonomous Robotics Systems (STARS) Lab **University of Toronto**
Undergraduate Researcher (Supervised by Prof. Jonathan Kelly) *May 2021–Sep 2021*

- Investigated efficient path planning on weighted graphs for planetary navigation with Python, using NASA's Mars 2020 Rover Mission as a performance benchmark
- Proposed novel methods for planetary path planning by leveraging geographical information from satellite data, resulting in reduced memory usage and computation time

Robotics and Automation Lab (RAL) **University of Toronto**
Undergraduate Researcher (Supervised by Prof. Andrew Goldenberg) *May 2020–Aug 2020*

- Prototyped an autonomous bed-making robot on a 6-DoF robot arm mounted on a mobile platform
- Created a depth image simulation pipeline using camera calibration techniques in Python to generate synthetic datasets for a 3D grasp point detection model
- Implemented SLAM and robot platform navigation using live input from a 2D LiDAR sensor

INDUSTRY EXPERIENCE

Trimble Applanix **Toronto, ON**
Autonomy Engineering Intern *May 2021–Sep 2021*

- Contributed towards a LiDAR-based SLAM and perception solution for autonomous vehicles
- Implemented GPU scheduling on a multi-GPU server for machine learning applications using Docker, Kubernetes, PyTorch, and TensorFlow
- Streamlined the continuous integration pipeline with new GPU-enabled regression and unit tests

EXTRACURRICULARS

aUToronto – University of Toronto's Self-Driving Car Team **Toronto, ON**
Perception Engineer *Jul 2021–Apr 2022*

- Designed an end-to-end 2D/3D object tracking pipeline for a student-led self-driving car team
- Implemented Bayesian statistics algorithms, such as Kalman filters and Hidden Markov Models, to achieve real-time tracking of bounding boxes in ROS and C++

Robotics for Space Exploration (RSX) **Toronto, ON**
Autonomy Engineer *Sep 2020–Sep 2021*

- Researched and implemented various GPS and SLAM algorithms for a Raspberry Pi-powered 4WD mini rover to achieve autonomous rover navigation

UofTHacks – Canada's Largest Student-Run Hackathon **Toronto, ON**
Logistics Coordinator *Jul 2020–Mar 2021*

- Organized a series of activities, workshops, and mini-events for UofTHacks VIII, which was attended by over 800 participants
- Coordinated diversity-focused workshops to foster an inclusive hackathon environment and encourage hacker participation from all backgrounds

RELEVANT SKILLS

- **Programming Languages:** Python, C/C++, MATLAB, Java
- **Libraries:** PyTorch, TensorFlow, NumPy, SciPy, scikit-learn, pandas, Matplotlib, Open3D, OpenCV
- **Tools:** Linux/Unix, ROS, Git, Docker, Kubernetes